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# OBSERVATIONS ON THE USE OF RIDGWAY'S NEW COLOR-BOOK.[1,2] THE COLOR OF THE SPORES OF VOLVARIA SPECIOSA FR.

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In using the recently published book, "Color Standards and Color Nomenclature," by Ridgway, the writer was confronted with certain difficulties which operate against exactness in color determination, viz.: the appearance of the complementary of an adjacent color in the one under observation; the darkening or lightening effects of backgrounds of varying degrees of luminosity; and the effect of area on colors.

As these difficulties will be encountered by others who may have occasion to consult this valuable repository of color tones, an account of some tests will doubtless prove of interest.

The writer wished to ascertain the precise color of a spore-print of the gill-fungus, *Volvaria speciosa* Fr. The print was about 15 cm. in diameter, and so dense as to cover completely the white paper underneath. On comparing the entire area of the print with the small color squares in the book, it was found that a tone somewhere between *l* and *k* of column 13, Pl. *III*, corresponded with the tone of the spore-deposit.[3]

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[1] Color Standards/and/Color Nomenclature/by/Robert Ridgway, M.S., C.M.Z.S., etc./Curator of the Division of Birds, United States/National Museum./With Fifty-three Colored Plates/and/Eleven Hundred and Fifteen Named Colors./Washington, D. C./1912./Published by the Author./(8 mo., colored frontispiece, pp. (I) II–III (IV), (1) 2–43 (44). Reviewed by P. L. Ricker in MYCOLOGIA 5: 172–174. March, 1913.)

[2] While the discussion here presented is confined to Ridgway's book, the deductions are applicable to any work which attempts to standardize colors by giving the colors themselves.

[3] The tests here recorded were conducted in a room, near a good-sized window in the north wall. Sky clear. No other illumination. No reflections from strongly colored objects outside. Wall-paper and near-by objects not conspicuous in color. Every test was verified by two persons.

But having learned, through experience, that colors appear brighter when spread over large surfaces than when confined to smaller ones, it was decided to cover the spore-print entirely with a piece of white paper measuring 15.5 cm. by 29 cm., and provided in the center with an aperture of the exact size of the color squares; a contrivance known as an excluder. Placing this excluder over the print so that only a small patch of the spore-covered surface showed, and then comparing this patch with the squares, it was learned that the tone 13 *m* on Pl. *III* matched perfectly, the reduction in area having had a darkening effect.

For the next test, a piece of carbon paper of the same size as the white sheet was procured, and, after providing it with an aperture of the same dimensions as the other, comparison was made. This time the spores agreed exactly with square *i,* column 13′, pl. *XV,* a tone, it will be noticed, very much lighter than either of those determined upon in the foregoing tests.

Finally, it was concluded to equalize conditions absolutely, both as to size of aperture and color of paper. Two sheets of the identical color of the mounts in Color Standards, cut to the size adopted for these tests, were applied, one to the print, the other to the squares, with the result that the spore-color tallied accurately with 13′ *k,* on Pl. *XV,*—again a different tone.

These tests may be repeated by anyone who will follow the methods described. Any color will answer the purpose, though a critical one, such as an indeterminate brown of medium depth, will exhibit the mutations more markedly. With excluders of a lively color the effect is quite surprising, as another set of tests with a sheet colored Cendre Green (Pl. *VI,* 35 *b*) demonstrates.

Except for the color, the sheet was in every respect like those used previously, but before applying it, an experiment was performed that again exhibited the effect of increased area on colors. It was found that when any part of the surface was brought in direct contact with the square of Cendre Green, the agreement was perfect; when, however, the surface was viewed as a whole, the color approximated rather closely Vanderpoel's Green (Pl. *VI,* 33 *b*), a yellower green than Cendre Green.

With this sheet the following changes were produced in some squares chosen at random:

Pl. *II* 11 *k* = Pl. *II* 9 *j*
Pl. *II* 11 *m* = Pl. *II* 9 *m*
Pl. *III* 15 *m* = Pl. *III* 13 *m* (almost)
Pl. *IV* 23 *f* = Pl. *IV* 21 *f*
Pl. *IV* 23 *k* = Pl. *IV* 20 *k*
Pl. *XXXIX* $5'''$ *d* = Pl. *XXXIX* $1'''$ *c*
Pl. *XL* $21'''$ *f* = Pl. *XXXIX* $14'''$ *e*

If one desired, tests might be carried on with sheets representing all of the colors of the spectrum, but in each test it would be found that the color tested had undergone a change of aspect, the degree and direction depending upon the color in juxtaposition. Indeed, by the use of a set of differently colored excluders a large number of new tones, each one a standard, might be obtained; but unfortunately, it would not be possible to turn these new tones to account, as the excluder, applied to the color to be compared, would itself have to be excluded, and without this important factor, comparison would be reduced to the hit-or-miss method we are endeavoring to eliminate.

In view of the discomforting deductions which cannot but be drawn from these tests, one is bound to accept the conclusion, long ago arrived at by artists, physicists, and others, that colors, as perceived by the human eye, are of an illusive nature and not fixed in the way generally supposed. This conclusion accepted, it behooves the devotees of the descriptive sciences to agree upon some means by the aid of which this source of error may be controlled.

The writer would suggest the issuing of two excluders (in supplementary form), each measuring 15.5 cm. by 29 cm., and colored to match the mounts in Color Standards. In the center of each, there should be an aperture of the size of the color squares. In addition, a note might be included enjoining the use of the excluders when accurate records are to be made. The note ought to state further, that users of the book, when referring to a tone, should indicate whether the excluders were employed. The abbreviation "+ std. excl." (plus standard excluders), added to a symbol, would suffice to show whether the observer had availed himself of this necessary adjunct in the work of color discrimination.

U. S. DEPARTMENT OF AGRICULTURE.